

Medical Aspects of Commercial Jet Air Travel

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IN THE PERIOD 1947 through 1955 deaths of passengers while in flight on American scheduled airlines ranged from seven a year to twenty.⁴ Of 41,623,000 passengers carried in 1955, only 18 died in flight. The United States Air Force has now successfully evacuated over 2,000,000 patients by air. These data emphasize the medical safety of air travel.

Further documentation is derived from a study¹ of the effects of air travel in 1,777 flights of patients with cardiac and pulmonary disorders carried by the Military Air Transport Service in 1949. Only nonpressurized aircraft were used, and the flights were at altitudes of up to 10,000 feet. There were 464 flights of patients with cardiac disease. In this group only four, an incidence of less than one per cent, had an aggravation of symptoms while in flight. In 568 flights of patients with pulmonary disorders, other than tuberculosis, 2.4 per cent had mild symptoms related to their disorder. In 745 flights of patients having pulmonary tuberculosis and complications of that disease, 2.7 per cent had mild or moderate symptoms relating to their disorder. There were no deaths in the entire series, and all flights were completed successfully.

If an ill or injured passenger can be transported at all, he can be transported long distances more expeditiously, more efficiently and with a greater degree of safety and comfort by air than by any other means. This is a conclusion arrived at from experience with conventional propeller-type aircraft. Use of jet aircraft, which will reduce flight time by approximately 50 per cent and provide a smoother, less noisy, vibration-free environment in the aircraft cabin, will further enhance the safe transportation of patients with greater comfort and less fatigue. The current American-built jet transports fly above turbulent weather at altitudes of 30,000 to 40,000 feet and have a cruising speed of approximately 600 miles an hour. At cruising altitude the pressurization system maintains the cabin pressure at the equivalent of an altitude of 6,700 feet, which is less than the pressure maintained at maximum cruising altitude by some of the more advanced propeller-driven aircraft. In an emergency situation the jet cabin pressure can be brought down to the sea level pressure by a descent of the aircraft to 22,500 feet.

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• Jet aircraft will further enhance the medically safe and comfortable transportation of persons with disease. Experience in military medicine, substantiated by civilian commercial air travel experience, has already proved that transportation of sick or disabled persons in propeller-driven planes is essentially benign.

Certain restrictions are necessary regarding carriage of sick passengers on commercial aircraft whether jet-propelled or of propeller type. These restrictions are primarily related to the comfort of fellow passengers and to the non-medical environment of commercial airliners rather than to any risk of air travel *per se*.

The one potential medical problem pertaining to passengers which is inherent in jet air transportation is a possible loss of pressurization while at cruising altitude. The partial pressure of oxygen at altitudes of 30,000 to 40,000 feet is not sufficient to maintain consciousness or life for more than a very short time. Great emphasis, therefore, has been placed on design features and testing of the new jet aircraft to prevent pressurization loss in flight. The more important design features in this regard are as follows:

1. The thickness and strength of the aircraft skin and structural members will withstand a much greater pressure differential than the differential of 8.6 pounds per square inch that is the standard requirement.
2. The fuselage is designed to resist tearing and to stop rips so that should openings in the fuselage occur they will not enlarge beyond an area of a few square inches and pressurization loss would be very slow.
3. The windows are small to minimize effects in case one breaks; and the possibility of leaks through a break is slight, for there are three panes of glass in each window, and either of the two outer panes alone can withstand the pressure differential.
4. The doors and hatches are sealed by pressure from within the fuselage, thus forming a plug from within outward.
5. There are three turbocompressors, each on a different engine, to supply pressure to the cabin. Any of them alone can do the job. If the mechanism for automatic cabin pressure control fails, the system can be controlled manually.

It is believed by aeronautical engineering author-

ities that the design characteristics of the jet make failure of pressurization as remote as wing failure. Even so, there are two other features for the protection of passengers against loss of pressure. One is the aircraft's ability to descend to 10,000 feet from 40,000 feet in two to three minutes, the passengers having a sensation like that of swift descent in an elevator. The descent can be begun instantly, for warning signals in the cockpit immediately alert the crew to any loss of pressure in the cabin. The second feature is oxygen masks that automatically pop out from an overhead compartment and dangle in front of each passenger's face if the cabin pressure reaches the equivalent of 12,000 feet. The masks supply a continuous flow of oxygen. Passengers always are instructed in use of the equipment before the aircraft reaches cruising altitude. Sudden anoxia could of course cause serious complications in certain persons, but the risk in this regard is probably much less than the varied risks involved in other types of transportation. The possibility of aeroembolism occurring with loss of pressurization is very slight, for passengers would be exposed to decreased atmospheric pressure for a very short time.

OTHER MEDICAL CONSIDERATIONS

As was noted previously, air travel *per se*, and particularly jet air travel, does not present a hazard to patients who are transportable. However, owing to a lack of medical facilities and trained medical personnel aboard commercial aircraft and in consideration of the comfort of fellow passengers, certain restrictions² are necessary:

1. A patient whose illness is objectionable to other passengers because of appearance or odor should not be permitted to travel on commercial aircraft.

2. Patients with contagious diseases should not be carried for obvious reasons.

3. A patient who, because of his illness, cannot take care of his needs should not be carried unless, by previous arrangements, a suitable medical attendant travels with him. Cabin attendants are usually too busy with routine duties to provide anything but simple emergency first aid care to an individual passenger.

4. Patients whose behavior might be upsetting or hazardous to fellow passengers should not be carried. This applies primarily to patients with severe emotional disturbances.

5. Patients with illness of a type or severity to present a serious hazard in a mild respiratory stress situation when expert medical care is not immediately available should not fly on commercial aircraft.

6. Illnesses associated with trapped gasses in body cavities, such as pneumothorax, should not fly because of gas expansion at altitude.

Problem cases should be evaluated for flight by the private physician on an individual basis. As an example, since there are no adequate facilities to perform a delivery in the air, a woman beyond the eighth month of pregnancy should not fly. Air travel is not injurious to an expectant mother or the unborn child, but a delivery in anything but medical environment can cause unnecessary problems.

Other specific examples^{3,4} of medical contraindication to flight on commercial airliners are: Advanced cardiac decompensation, cyanosis, vital capacity of 50 per cent of normal or less, severe anemia (hemoglobin content less than 8.5 gm. per 100 cc.), status asthmaticus, mandibular fixation by wiring unless of the "rip cord" type to permit opening of the mouth in event of airsickness and vomiting, poorly controlled epilepsy, and myocardial infarction within six weeks of onset. Infants less than 14 days old should not be taken aloft because of instability of the respiratory mechanisms.

Airline medical directors are available for consultation, with the personal physician, on cases presenting special or difficult problems in relation to air travel.

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